Name: _____ Section: _____

Chem 226 / Dr. Rusay

ORGANIC MOLECULES (I) WORKSHEET

Bonds, Structures, Formulas & Shapes

Review the fundamental principles of covalent bonding for uncharged compounds, Lewis structures, and VSEPR. Refer to the attached Tables. **These concepts are <u>absolutely</u> indespensible to the understanding of organic chemistry.** Practice and master them. They will be used repeatedly throughout the course and are absolutely essential to your understanding and success.

1.) The word "bond" in Webster's Dictionary has twelve different meanings as a noun and six as a verb. Define in your own words in one short sentence what you think what “bond” means in the context of organic chemistry.

2.) Write formulas for as many different possible molecules that can be produced from combinations of the following elements (Provide as many as you think reasonable. If there are too many to consider, provide a number that you think might approximate the total, eg. hundreds, thousands, millions, etc.)

Sodium and Chlorine:

Na and Cl and Oxygen:

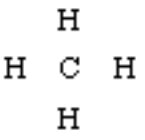
Na and Carbon and Oxygen:

Carbon and Hydrogen and Oxygen:

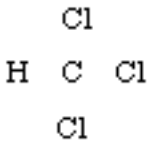
3.) What accounts for the different possible number of molecules in the above cases? (Briefly answer in a sentence or two.)

4.) Complete the Lewis structures for the following compounds showing **all** electrons:

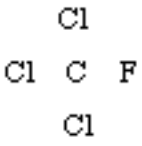
Methane (CH_4):



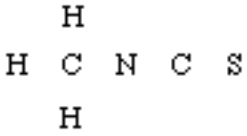
Chloroform:



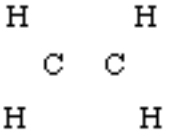
Freon $_{11}$:



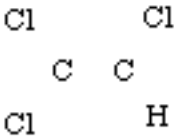
Methylisothiocyanate:



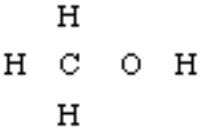
Ethylene:



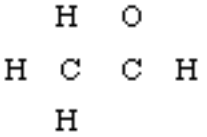
Trichloroethylene:



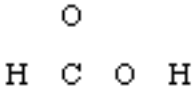
Methanol:



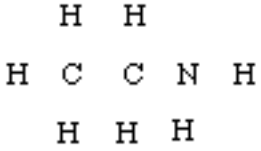
Ethanal (Acetaldehyde):



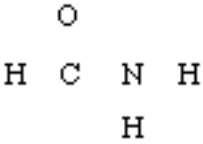
Formic acid:



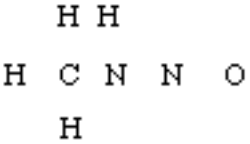
Ethyl amine:



Formamide:



Methyl nitrosamine:



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5) Review the VSEPR tutorial:
http://www2.gasou.edu/chemdept/general/molecule/tutorial/index.htm

Complete the table on the next page which relates to the following Web-page:
http://ep.llnl.gov/msds/Chem120/226shapes-04.html

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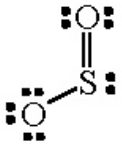
http://ep.llnl.gov/msds/Chem120/226shapes-04.html

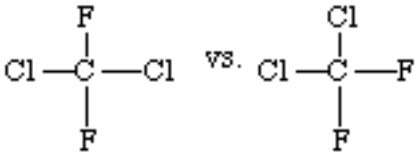
Click on the active link in each of the squares in the Web page for a molecule's image. The images must be manipulated in order to get an accurate view of the molecules; not all of the atoms will be visible without doing so. Complete the following table for each image: **1)** Write the molecular formula for the molecule. **2)** Identify the number of valence electrons for each atom in the molecule and the total number of electrons for the complete molecule. **3)** Draw a Lewis structure that represents the molecule, **4)** Describe the shape of the molecule, and to the best of your ability indicate if you think that molecule is polar or non-polar. For example, 4A: SO_2, S=6, O=6, SO_2=18, bent shape, polar.

	A	B	C
1			
2			
3			
4	SO_2, S=6, O=6, SO_2=18, bent shape, polar 		

6) a) Write the molecular formula for each of the following structures. b) Using models, determine if the pairs are the *SAME or DIFFERENT or ISOMERS*. Circle your choice. Practice the Web exercises converting to and from line and condensed formulas. Links are found at: **http://ep.llnl.gov/msds/orgchem/Chem226/Bonds-Structures.html**

a) Molecular formula:

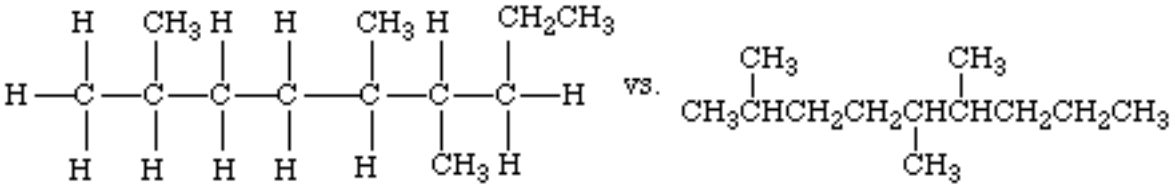
_____ _____



SAME or DIFFERENT or ISOMERS

b) Molecular formula:

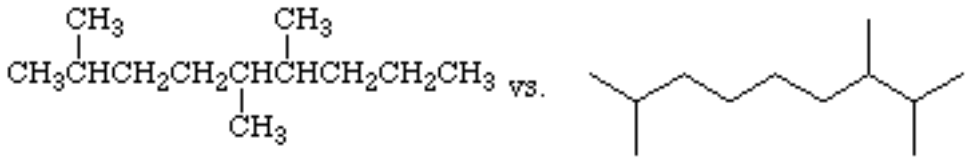
_____ _____



SAME or DIFFERENT or ISOMERS

c) Molecular formula:

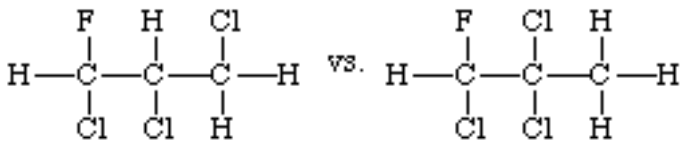
_____ _____



SAME or DIFFERENT or ISOMERS

d) Molecular formula:

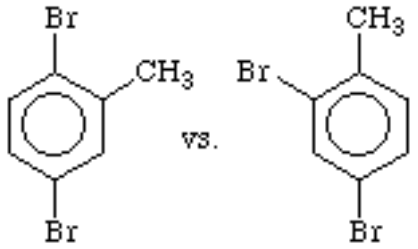
_____ _____



SAME or DIFFERENT or ISOMERS

e) Molecular formula:

_____ _____



SAME or DIFFERENT or ISOMERS

7) Neatly and correctly draw as many ***Kekulé*** or ***condensed formulas*** as you can for all of the possible isomers of the molecular formula $\mathbf{C_4H_{10}O}$ without using models. (Use the models to check your proposals.)

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8) On a separate paper neatly answer question #3 from the following problem set and attach it to the completed Worksheet. Questions #1 and #2 are to be answered on the Worksheet.